

Nine Years Later: Exposures after the World Trade Center Attacks, with Paul Lioy

Ashley Ahearn

Views and opinions expressed in these podcasts are those of the interview subjects and do not necessarily reflect the views, opinions, or policies of *EHP* or of the National Institute of Environmental Health Sciences.

The collapse of the World Trade Center buildings on 11 September 2001 created a massive cloud of dust that blanketed lower Manhattan and parts of Brooklyn. That dust comprised a complex mixture of building materials, office equipment, jet fuel, and combustion by-products. In this podcast, Paul Lioy discusses how this dust differs from other particulate matter and how these differences may have affected the health of those who were exposed to the dust. Lioy is the deputy director of the Environmental and Occupational Health Sciences Institute at the Robert Wood Johnson Medical School and Rutgers University. He is also the author of the book *Dust: The Inside Story of Its Role in the September 11th Aftermath*.

AHEARN: It's *The Researcher's Perspective*. I'm Ashley Ahearn.

As we continue our coverage of the anniversary of the September 11th attacks, we are joined by Dr. Paul Lioy. He's the deputy director of the Environmental and Occupational Health Sciences Institute at the Robert Wood Johnson Medical School and Rutgers University. He's also written a book called *Dust: The Inside Story of Its Role in the September 11th Aftermath*.¹

Dr. Lioy, thanks for being here.

LIOY: Thank you for having me.

AHEARN: After the attacks, in every shot, all the news footage, we saw this whitish-gray dust floating through the air and blanketing lower Manhattan and parts of Brooklyn. Dr. Lioy, why don't you start by telling us about that dust.

LIOY: Well, first of all, it was a complex mixture. The dust was not like anything I really had ever seen before, because it was a material that was very common to us, because it

was basically the materials they use to build a building and the things that people use in a building—you add upon that, however, the jet fuel that was pouring out of the airplanes once they hit the building and then the subsequent fires, and you have a complex mixture of building materials and material that was introduced either through combustion or the leakage of gasoline down the sides of the building.

AHEARN: And when you say building materials, I'm thinking asbestos. We've got some other stuff in there that are known carcinogens, known toxic substances.

LIOY: I think that's what people initially were focusing on, was asbestos. But asbestos was not the primary thing of concern at the moment, something that I think most people didn't recognize, because asbestos has long-term health effects—you breathe a lot of it, and you have a lot of opportunity for it to deposit in the lung. Here we're dealing with acute exposure, so the materials of concern would not be asbestos; it would be other materials that are part of the buildings.

The most important part, though, is the fact that the buildings collapsed. And when they collapsed, they collapsed at such a high rate of speed that you ended up with the building materials being pulverized to dust. So, you have pulverized building materials, which included concrete and wallboard and glass from the 110 stories of windows, and then you add upon that the material that would be combusted during the fires, and that's what the primary composition was, and over 50 percent of the mass was basically pulverized concrete. That in its own right wouldn't lead one to raise an eyebrow, but the fact of the matter is, is that the pH is very high—it means it was very alkaline dust, and therefore that could irritate the lung, and that was some of the initial findings that we had.

AHEARN: Now, you've done some reconstructive modeling of the exposures.² Who was at the highest risk, and what do we know about exposure rates among the volunteers and rescue workers at Ground Zero?

LIOY: The reconstruction really did demonstrate that the people who were highest-exposed were those workers and volunteers who were at Ground Zero during the first 24 to 72 hours. This was, I think, validated by the [clinical] work of David Prezant's from the New York City Fire Department,³ who also showed that the people who had the first indications of the World Trade Center cough⁴ were those who were down there very early on. So those were the people who had the highest acute exposures.

The fascinating thing about that is that these were *upper*-airway observations of symptoms, and that would be inconsistent with the normal routine thoughts about fine particles in the atmosphere, which are very, very tiny and go deep into the lung. This dust—not only in terms of having a composition which was different—also had a particle-size range which was different: most of the particles were over 10 microns in diameter. That means they were very large, and in my book, *Dust*, I talk a lot about the size distribution as they go to different parts of the lung and then also characterize and focus on these “supercoarse” particles, which in fact would deposit in the upper airways.

So, you had the pH, you had very large particles, which we associated with this high pH, and you had these glass fibers, which would lead to the initial thoughts that the upper-airway symptoms were being caused by something other than one would see in a traditional air pollution situation, which would be mostly fine particles. There were fine particles, very, very small percent of the mass, maybe less than 1 percent, and a large quantity of that was the combustion products that one would normally see in a fire.

AHEARN: Dr. Liroy, 9/11 was very different from a lot of the other environmental health issues that I would imagine that you've studied in the past. Could you talk a little bit about that?

LIOY: In the past, other events occurred, and the ones that people more typically look at are ones where you have a chemical release or a biological weapon, and you can have a defined set of materials that you're concerned about in exposures. This may not be a simple situation, it may in fact be very complex to deal with, but it's usually not as

complex as the collapse of two 110-story buildings and pulverization to dust—ten million tons of material—and that this dust would in fact be resuspended, suspended in the air, people would be breathing it, and there in fact may be another source of exposure that could lead to some kind of health outcome. So from this we learned: keep your mind's eye on the target, which is the event, and not just what you think you want to sample, or what you can sample, so that you get a better picture, and you can handle the situation much more quickly and much more effectively.

AHEARN: Dr. Lioy, what calls you to do this research?

LIOY: I feel I have a public service. In fact, when I first got involved—and I actually wrote about it in the book—is that when my friends and colleagues from around the country heard that we were collecting samples they came out of the woodwork, saying, “Paul, what can we do to help? We don’t care if we ever get paid. The whole idea is we feel we need to pay back and see if we can do something to be of help in this situation.” And I was very pleased with the way people responded because it was from the standpoint of being Americans and trying to help America in its time of need in any way they could. So I look at the way I do things in my science as a payback for having a career that was fostered in a country like America and being able to do things in a way that allows me to think clearly, out of the box, and help in times of need.

AHEARN: Dr. Lioy, thanks so much.

LIOY: You’re welcome.

AHEARN: Dr. Paul Lioy is the deputy director of the Environmental and Occupational Health Sciences Institute at the Robert Wood Johnson Medical School and Rutgers University, and he is the author of the book *Dust: The Inside Story of Its Role in the September 11th Aftermath*.

And that’s *The Researcher’s Perspective*. I’m Ashley Ahearn. Thanks for downloading!

REFERENCES AND NOTES

¹ Liroy PJ. *Dust: the inside story of its role in the September 11th aftermath*. Lanham, MD:Rowman & Littlefield Publishers, Inc. (2010).

² Liroy PJ, Georgopoulos P. *Ann N Y Acad Sci* 1076:54–79 (September 2006); doi:10.1196/annals.1371.002.

³ Webber WP, et al. *Environ Health Perspect* 117(6):975–980 (2009); doi:10.1289/ehp.0800291.

⁴ World Trade Center cough is defined as a persistent cough that developed after exposure to the Ground Zero site and was accompanied by respiratory symptoms severe enough to require medical leave for at least four weeks.

Ashley Ahearn, host of *The Researcher's Perspective*, has been a producer and reporter for National Public Radio. She is an Annenberg Fellow at the University of Southern California specializing in science journalism.